

REMARKS

Claims 23-31 were pending in this application prior to the final office action. By this amendment, claims 23-31 are canceled, and new claims 32-37 are added. Thus, claims 32-37 are now pending. In view of the above amendments and the following remarks, Applicants respectfully request reconsideration and allowance of the application.

Claims 23-31 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over the Japanese document 09-161845 (hereinafter referred to as "*the JP'845*") in view of U.S. Patent No. 4,475,994 to Gagne et al. However, in view of the cancellation of claims 23-31 herein, Applicants address the rejections with respect to new claims 32-37.

The Examiner asserts that JP'845 discloses a non-aqueous electrolyte secondary battery comprising a non aqueous electrolyte solution (TITLE) including organic solvents and a lithium compound dissolved (*the electrolyte*) therein (ABSTRACT), and that JP'845 discloses lithium batteries (SECTION 0001-0002/ABSTRACT) comprising a positive electrode and a negative electrode (ABSTRACT) wherein the negative electrode is a carbonaceous materials having a d_{002} lattice distance of 0.3365 nm or more (SECTION 0009 & 0012). In addition, the Examiner asserts that JP'845 discloses the use of dinitrile compounds in the electrolytic solution (SECTION 0015) including at least succinonitrile and glutaronitrile (SECTION 0025-0026).

Further, the Examiner asserts that EXAMPLE 6 exemplifies the use of glutaronitrile in electrolytic solutions (EXAMPLE 6), discloses that all of the solvents can be used alone or in combination, that is, mixture thereof (SECTION 0026, 0015, 0002), and at once envisage the combined use of the aforementioned electrolyte solvents. The Examiner also asserts that the JP'845 exemplified the use of nitrile compounds including propionitrile in an amount of 17.8 vol %; and glutaronitrile in an amount of 19 vol % of the electrolytic solutions (EXAMPLES 5-6), and discloses the use of cyclic carbonate such as propylene carbonate, ethylene carbonate and the likes; cyclic ester such as γ -butyrolactone; linear carbonate such as dimethyl carbonate, diethyl carbonate, ethyl methyl carbonate; and/or ether such as tetrahydrofuran and the likes (SECTION 0002, SECTION 0002, 0015, 0020, 0024-0026/

EXAMPLES 1-8 & COMPARATIVE EXAMPLES 1-4). However, the Examiner correctly states that JP'845 does not expressly disclose the specific nitrile amount recited in the claims.

In this regard, the Examiner asserts that Gagne discloses an electrochemical cell (ABSTRACT) comprising an aprotic solvent containing a dissolved salt (COL 3, lines 61-64) wherein nitriles such as succinonitrile, adiponitrile among others are added to the electrolyte in an amount of at least about 1 % by weight of thereof to the total weight of the electrolyte solution to stabilize the electrolyte. *Thus, the Examiner asserts that Gagne teaches with sufficient specificity the use of a specific amount of specific dinitrile compound*, and that it would have been obvious to one skilled in the art at the time the invention was made to use the specific nitrite amount of Gagne in the battery of the JP'845 because Gagne teaches that nitriles are added to the electrolyte in the claimed amount to stabilize the electrolyte. Therefore, the Examiner asserts that the specific nitrite amount provides improved chemical stability, and that the teachings of Gagne are found pertinent and applicable to the teachings of the JP'845, and thus, one of ordinary skill in the art would have easily arrived at the claimed invention by simply looking at the teachings of Gagne.

Moreover, the Examiner asserts that a prima facie ease of obviousness exists because the prior art teaches adding the specific dinitrile compound in an amount of at least about 1 by weight, therefore, the invention taught by the prior art certainly allows for concentrations or magnitudes either slightly above or below 1 wt % (*i.e. slightly greater or lower than 1 wt %*), and hence, the disclosed range overlaps or lies inside the claimed range., and that differences in concentration will not support the patentability of subject matter encompassed by the prior art unless there is evidence indicating such concentration is critical.

However, Applicants respectfully disagree with the Examiner's assertions and submit that neither JP'845 nor Gagne, taken alone or in combination, render the invention recited in claims 32-37 obvious under 35 U.S.C. § 103(a).

In particular, independent claim 32 recites a lithium battery comprising a positive electrode, a negative electrode comprising a carbonaceous material of graphite crystal structure, and a non-aqueous electrolytic solution, wherein the non-aqueous electrolytic solution comprises an electrolyte and *a non-aqueous solvent comprising a cyclic carbonate and a*

linear carbonate in a volume ratio of 1:9 to 9:1, the non-aqueous solvent further containing adiponitrile in an amount of 0.01 to 1.0 wt.%. In addition, independent claim 35 recites a lithium battery comprising a positive electrode, a negative electrode comprising a carbonaceous material of graphite crystal structure, and a non-aqueous electrolytic solution, wherein the non-aqueous electrolytic solution comprises an electrolyte and a non-aqueous solvent comprising a cyclic carbonate and a linear carbonate in a volume ratio of 1:9 to 9:1, the non-aqueous solvent further containing glutaronitrile in an amount of 0.01 to 1.0 wt.%.

JP'845 generally discloses a non-aqueous electrolyte secondary battery comprising a non-aqueous electrolyte solution including organic solvents and a lithium compound dissolved therein, and further discloses the use of lithium batteries comprising a positive electrode and a negative electrode wherein the negative electrode is a carbonaceous materials having d_{002} lattice distance of 0.3365 nm or more.

However, while JP'845 generally discloses the use of one of glutaronitrile and adiponitrile in the electrolytic solution, there is no teaching whatsoever regarding the range of amount of the glutaronitrile or adiponitrile in the electrolytic solution, apart from the disclosure in Example 6 that glutaronitrile is used in an amount of 19 vol.% of the electrolytic solution. Therefore, as admitted by the Examiner, the only disclosure in JP'845 regarding the specific nitrile amount is the use of a nitrile compound at a relatively large amount such as approximately 20 vol.%.

In an attempt to overcome this clear deficiency in JP'845, the Examiner asserts that Gagne disclose an electrochemical cell (ABSTRACT) comprising an aprotic solvent containing a dissolved salt (COL 3, lines 61-64) wherein nitriles such as succinonitrile, adiponitrile among others are added to the electrolyte in an amount of at least about 1% by weight of thereof to the total weight of the electrolytic solution to stabilize the electrolyte. However, while Gagne generally discloses an electrochemical cell (ABSTRACT) comprising an aprotic solvent containing a dissolved salt (COL 3, lines 61-64), no disclosure regarding the nitriles is given in these portions of Gagne. Instead, Gagne discloses the use of nitriles at col. 6, lines 29 to 43, which reads as follows:

“In addition to the above described technique of maintaining the aqueous electrolyte at a relatively high pH to stabilize the superoxide ion, further stabilization can be provided in accordance with this invention by adding one or more nitriles to the electrolyte. Non-limiting examples of nitriles contemplated for use in accordance with practice of this invention include benzonitrile, propionitrile, butyronitrile, malononitrile, succinonitrile, adiponitrile, cyanoacetate, 2-cyanoethyl ether, the cyanopyridines, polyacrylonitrile and acrylonitrile copolymers, polycyanoacrylate and cyanoacrylate copolymers.

Preferably such nitriles are added to the electrolyte in an amount to provide at least about 1% by weight of the nitrile to the total weight of the electrolyte solution.”

Thus, according to Gagne, the nitrile compound appears to be used in an aqueous electrolyte at a relatively high pH to stabilize the superoxide ion.

In addition, on page 6 of the Office Action, the Examiner asserts that “the teachings of Gagne et al are found pertinent and applicable to the teachings of the JP'845 and the field of applicant's endeavor as Gagne et al is strictly concerned with the addition of nitrile to electrolyte to stabilize it regardless of the specific chemical system (i.e. organic or aqueous), and thus, one of ordinary skill in the art would have easily arrived at the claimed invention by simply looking at the teachings of Gagne et al.” However, as described previously, the nitrile compound in Gagne is instead used in an aqueous electrolyte at a relatively high pH to stabilize the superoxide ion. In other words, Gagne merely teaches that the addition of the nitrile compound in an amount of approx. 1% or more is effective to stabilize a superoxide ion in an aqueous electrolyte at a relatively high pH.

In contrast, the solvent of the electrolyte used in the claimed invention and in the JP'845 is a non-aqueous solvent. Apparently, the relatively high pH is hardly observed in the non-aqueous solvent and the superoxide ion is hardly produced in the non-aqueous solvent. Accordingly, contrary to the Examiner's assertions, there is no motivation to apply the technical information to the invention set forth in the JP'845, and a person of ordinary skill in the art at the time of the invention would not have found any motivation to combine the teachings of JP'845 and Gagne to achieve the claimed invention.

In addition, independent claim 32 now recites that “the non-aqueous electrolytic solution comprises an electrolyte and a non-aqueous solvent comprising a cyclic carbonate and a linear carbonate in a volume ratio of 1:9 to 9:1, the non-aqueous solvent further containing adiponitrile in an amount of 0.01 to 1.0 wt.%” and independent claim 35 now recites “the non-aqueous electrolytic solution comprises an electrolyte and a non-aqueous solvent comprising a cyclic carbonate and a linear carbonate in a volume ratio of 1:9 to 9:1, the non-aqueous solvent further containing glutaronitrile in an amount of 0.01 to 1.0 wt.%.” These features more clearly specify the nitrile compound, the composition of the non-aqueous solvent, and the range of the amount of the nitrile compound, which are not disclosed by JP’845 or Gagne, taken alone or in combination.

Thus, for at least the above reasons, and in view of the cancellation of claims 23-31 herein, Applicants respectfully submit that the rejection of claims 23-31 under 35 U.S.C. § 103(a) as being unpatentable over JP’845 in view of Gagne should be withdrawn. Furthermore, Applicants submit that new claims 32-37 are allowable over the combined teachings of JP’845 and Gagne, and would not have been obvious to a person of ordinary skill in the art at the time of the invention. As such, Applicants respectfully submit that claims 32-37 are not obvious under 35 U.S.C. § 103(a) in view of JP’845 and Gagne.

The present amendment is submitted in accordance with the provisions of 37 C.F.R. §1.116, which after Final Rejection permits entry of amendments placing the claims in better form for consideration on appeal. As the present amendment is believed to overcome outstanding rejections under 35 U.S.C. §103, the present amendment places the application in better form for consideration on appeal. It is therefore respectfully requested that 37 C.F.R. §1.116 be liberally construed, and that the present amendment be entered.

In view of the foregoing, it is submitted that the present application is in condition for allowance and a notice to that effect is respectfully requested. If, however, the Examiner deems that any issue remains after considering this response, the Examiner is invited to contact the undersigned attorney to expedite the prosecution and engage in a joint effort to work out a mutually satisfactory solution.

Except for issue fees payable under 37 C.F.R. § 1.18, the Commissioner is hereby authorized by this paper to charge any additional fees during the entire pendency of this application including fees due under 37 C.F.R. §§ 1.16 and 1.17 which may be required, including any required extension of time fees, or credit any overpayment to Deposit Account No. 19-2380. This paragraph is intended to be a **CONSTRUCTIVE PETITION FOR EXTENSION OF TIME** in accordance with 37 C.F.R. § 1.136(a)(3).

Respectfully submitted,

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